

B. Fleming
SBL workshop, CERN
September 26, 2014

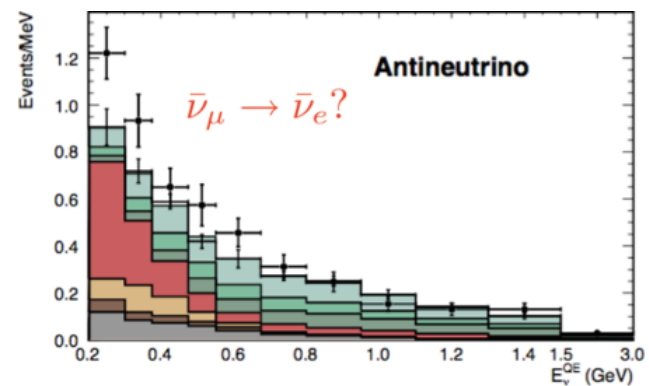
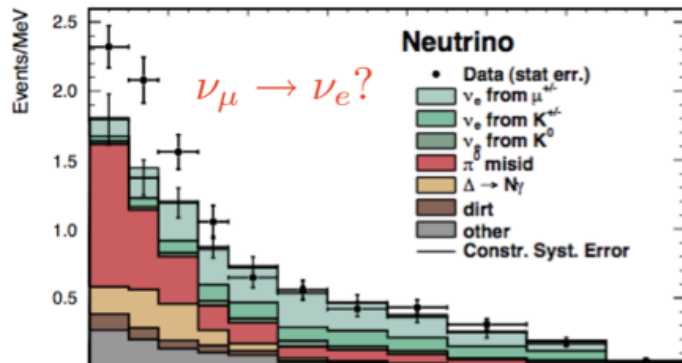
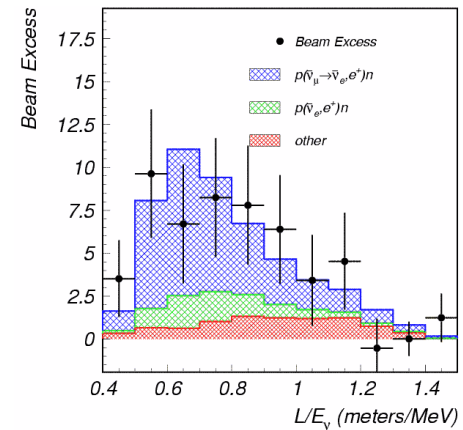
Discussion on What if MicroBooNE sees.....

- Electrons
- Photos
- Mixture
- Nothing
- *Something else*

Standard Question....

Short Baseline Oscillation Hints

- Accelerator anomalies
 - LSND allowed region
 - MiniBooNE ν and $\bar{\nu}$ signals



- Reactor and Source anomalies

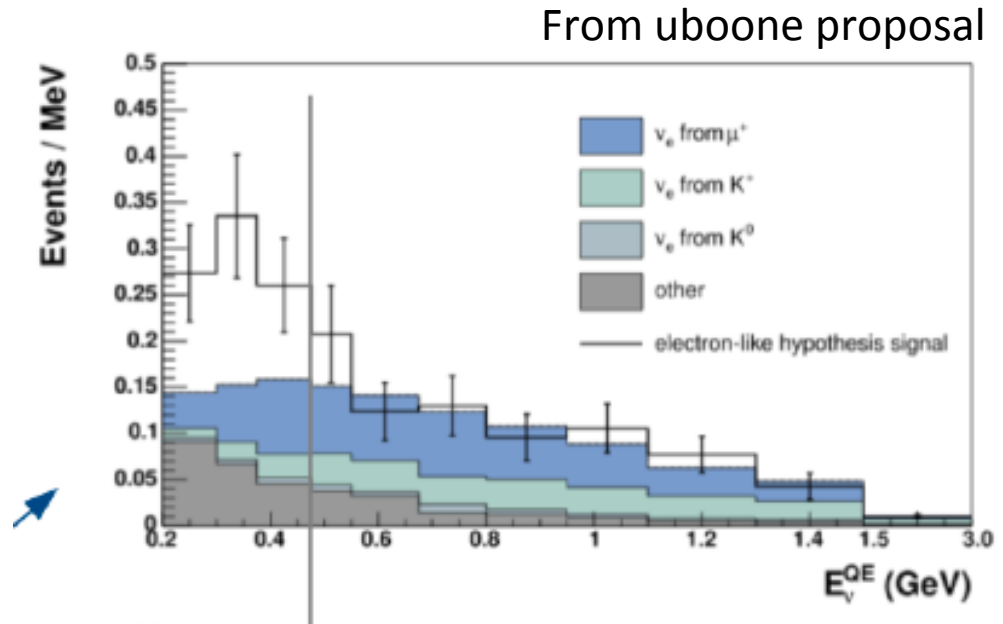
What question did MicroBooNE set out to address:

- Definitively address the nature of the MiniBooNE neutrino low energy excess (Philosophy: Test exactly what has been seen in MiniBooNE but now with a more sensitive detection technique (e/ γ separation))
- What questions are there beyond this?
 - Interpretation of signal (LAr1-ND)
 - Sensitivity over entire allowed region of LSND in neutrino parameter space in neutrino mode (ICARUS + LAr1-ND (+ MicroBooNE))
 - Anti-neutrino mode

Note: Justification for running given different MicroBooNE outcomes in this talk relates only to physics outcomes. Regardless of Physics Motivation given different outcomes, the SBN program has Development goals

MicroBooNE outcomes

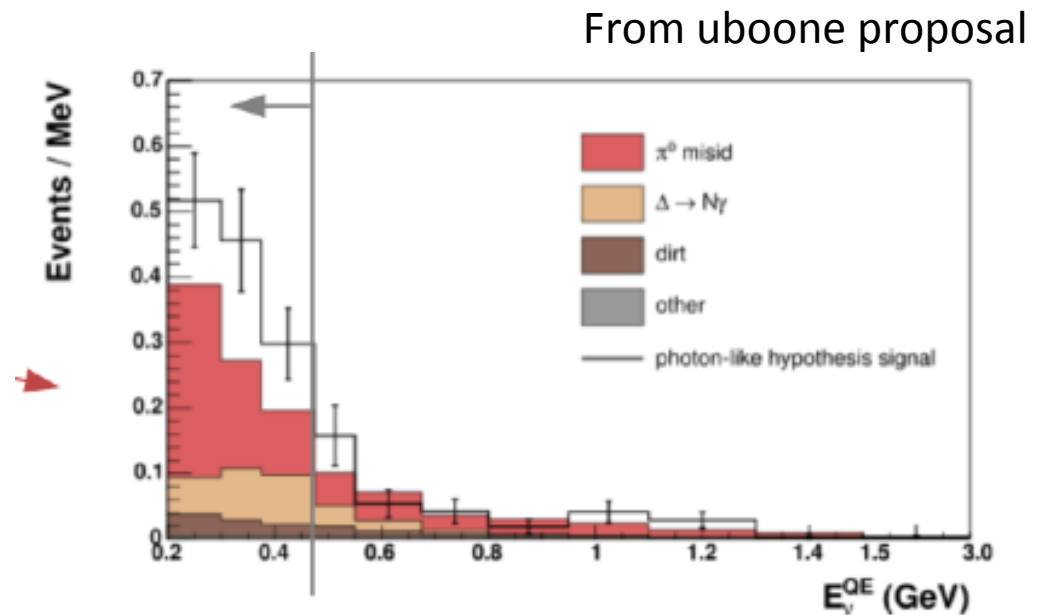
- Low energy excess = Electrons
 - Immediate need for LAr1-ND for near detector comparison with intrinsic ν_e spectrum
 - Immediate need for ICARUS for higher statistics measurements at 600m in combination with MicroBooNE – map out the oscillations in L , and have sensitivity over broader range of neutrino parameter space



- Compelling justification to proceed with $\bar{\nu}$ running (more beam or more detector mass and/or magnetization!)

MicroBooNE outcomes

- Low energy excess = Photons
 - Immediate need for LAr1-ND to look for signal in near location and to characterize it
 - (background source
 - Something new?)
 - ICARUS results explore sensitivity to ν_e appearance over broader range of neutrino parameter space



- What about $\bar{\nu}$ mode? Less justification for running beyond neutrino run. (Assume mboone ν and $\bar{\nu}$ running are same explanation.) LSND?

MicroBooNE outcomes

- Low energy excess is a mixture of electrons and photons (difficult scenario)
 - Comparison to near detector results critical (LAr1-ND)
 - Higher statistics with ICARUS critical for low energy excess and for entire neutrino parameter space region
- Something else (more difficult)
 - Don't know what you are looking for
 - Problem mBooNE had – presentation to community impacts credibility – “another anomaly! ...”
 - How do we prepare for this?

MicroBooNE outcomes

- Low energy excess is not there....
 - Least compelling situation wrt justification for the rest of the program
 - Confirm nothing is seen at near location (LAr1-ND)
 - Explore entire neutrino parameter space with ICARUS